

**Before the  
Federal Communications Commission  
Washington, DC 20554**

In the Matter of	)	
	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
	)	
Expanding Flexible Use in Mid-Band Spectrum	)	GN Docket No. 17-183
Between 3.7 and 24 GHz	)	

**REPLY COMMENTS OF MICROSOFT CORPORATION**

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Microsoft Corporation (“Microsoft”) hereby submits its Reply Comments in the above-captioned Notice of Proposed Rulemaking (“NPRM”) proposing unlicensed use of the 5.925 – 7.125 GHz band (“6 GHz” band).<sup>1</sup> In its Comments, Microsoft applauded the Commission for recognizing the enormous economic impact of unlicensed spectrum uses, such as Wi-Fi, to the U.S. economy; for further recognizing that within a few years there will be insufficient Wi-Fi capacity to meet demand if additional spectrum for unlicensed operations is not made available; and for proposing rules authorizing unlicensed operations across the entire 6 GHz band to meet the projected demand by leveraging high-throughput Wi-Fi channels. Unlicensed operations will share the 6 GHz band with incumbents on a secondary basis, meaning licensed incumbent operators will be protected from receiving harmful interference and still be able to expand their respective footprints.

**I. INTRODUCTION AND SUMMARY**

There was broad support in the Comments for the Commission’s proposal to make the entire 6 GHz band available, on a shared basis, for unlicensed services. There were differing

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<sup>1</sup> *In the Matter of Unlicensed Use of the 6 GHz Band*, Notice of Proposed Rulemaking, ET Docket No. 18-295, FCC 18-147 (rel. Oct. 24, 2018); *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017). All Comments referenced herein were filed on or about February 15, 2019 in response to the NPRM.

views for each U-NII sub-band as to whether the Commission should authorize indoor and/or outdoor use; whether the Commission should authorize fixed, mobile, and/or nomadic unlicensed operations; and for each combination of the above, whether Automated Frequency Coordination (“AFC”) should be required and what the maximum power level should be. Many incumbent operators expressed concern that, absent appropriate technical rules, unlicensed services could create harmful interference to incumbent operations. Microsoft acknowledges that these licensed incumbent operators provide important services and that the Commission’s Interference Protection Criteria (“IPC”) and the corresponding technical and operational rules for unlicensed operations should protect each licensed service from harmful interference. But to be clear, such rules should not be driven by the most unlikely of corner cases or leveraged by incumbent operators as an opportunity to squeeze another few years of service life out of outdated legacy communications equipment.

Microsoft submits that the Commission’s proposed IPC and the corresponding operational and technical rules provide a good foundation for authorizing shared use of the 6 GHz band. Combined with the modifications proposed by Microsoft, the Wi-Fi Alliance, 6 USC and like-minded Commenters, the proposed rules strike the right balance between providing commercially-viable shared access to the 6 GHz spectrum that enables a broad range of commercially important unlicensed use cases, while protecting incumbent licensed users from harmful interference.<sup>2</sup> Further discussion in the docket, therefore, should focus on the details of the appropriate operational and technical rules for each of these important use cases, not whether unlicensed services should be authorized throughout the 6 GHz band.

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<sup>2</sup> 6 USC is a reference to the following companies which submitted joint Comments and will be submitting joint Reply Comments: Apple, Inc., Broadcom, Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Marvell Semiconductor, Inc., Microsoft Corporation, Qualcomm Incorporated, and Ruckus Networks, an Arris Company.

Specifically, there was broad support in the Comments for authorizing low-power indoor-only (“LPI”) operations across the entire 6 GHz band and for authorizing LPI client devices to operate at the same maximum radiated power level as LPI access points. There was, however, some debate about whether AFC should be required for LPI operations in the U-NII-5 and U-NII-7 bands. Microsoft and many other commenters demonstrated that AFC is not needed to protect licensed operations in the U-NII-5 and U-NII-7 bands, would add unnecessary cost and complexity, and would discourage investment in the emerging LPI ecosystem. Broadcast interests expressed concern about the potential for harmful interference from LPI to outdoor BAS systems operating in the U-NII-6 and U-NII-8 bands. This concern was based on a flawed analysis using many of the same unrealistic assumptions made by some fixed service commenters with respect to LPI operations in the U-NII-5 and U-NII-7 bands and ignores completely how the industry’s ENG crews operate today. The development and rapid deployment of inexpensive, easy to use LPI devices is essential to maximizing use of the 6 GHz band, and thereby, to maximizing the availability of high-throughput Wi-Fi to U.S. consumers.

## **II. INTERFERENCE FROM LPI DEVICES TO INCUMBENT OPERATORS IS HIGHLY UNLIKELY**

The IPC and operational and technical rules proposed by the Commission, with the modifications proposed by Microsoft, will protect incumbent users from harmful interference. In fact, even without the proposed rules, at the EIRP level discussed for LPI devices, the risk of interference is extremely small. Using a highly conservative interference threshold, the RKF Study found that the operation of *standard-power* RLAN devices, operating both outdoors (at power levels up to 4 W EIRP) and indoors, would result in less than 0.2% of the FS links receiving a signal strong enough to cause

interference to the FS receiver.<sup>3</sup> The potential for interference from *indoor-only* devices operating at a maximum of 250 mW EIRP will be far less.

The incumbent operators themselves understand that LPI devices are unlikely to cause harmful interference to incumbent operations. For example, the Fixed Wireless Communications Coalition (“FWCC”) noted that “[d]ecades of experience show that interference is rare ....”<sup>4</sup> In advocating for overly restrictive technical rules, FWCC conceded that its own proposal “is the only way to catch the *one-in-a-million* interference cases that slip through the statistical methods.”<sup>5</sup>

Incumbent operators have vastly overstated the risk of interference by failing to take into account several material factors, each of which, on its own, will mitigate interference, and taken together, will significantly mitigate the already very small risk of interference from LPI devices. The incumbent operators’ analysis focused on “worst worst-case” scenarios – stacking all possible reasons for interference, regardless of how unlikely they are to occur, while ignoring some important mitigating factors and minimizing others, and assuming free-space propagation conditions rather than more realistic propagation models. Additionally, given the sensitivity of sharing study outputs to Wi-Fi parameter inputs, it is not surprising that some Commenters opposing unlicensed operations across the 6 GHz band or proposing more restrictive unlicensed operations in the band, amped up the Wi-Fi duty cycle from 0.44% -- what the experts in

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<sup>3</sup> Apple Inc., Broadcom Corporation, *et al.*, Jan. 25, 2018 Ex Parte, Frequency Sharing for Radio Local Area Networks in the 6 GHz Band, January 2018 (“RKF Study”) at 53.

<sup>4</sup> FWCC Comments at 3.

<sup>5</sup> *Id.* at 5 (emphasis added).

the Wi-Fi ecosystem used in their analysis as a realistic worst case<sup>6</sup> -- to values ranging all the way up to a “full buffer” 100% duty cycle in their simulation models.<sup>7</sup>

Sharing in any spectrum band would be impossible if the Commission acts as our opponents suggest and adopts rules to ensure that there would be zero risk of interference. Clearly, this is not a desirable outcome. Thus, it is imperative for the Commission to assess all possible factors so as to put in place operational and technical rules that will ensure that the risk of harmful interference is extremely small.

FWCC itself concedes that its highly restrictive approach “will be complex and correspondingly expensive ....”<sup>8</sup> If the rules are too stringent, the effect will be to raise the cost of unlicensed devices to a level that the market, particularly the market for consumer devices, will not accept. In the best of circumstances, overly stringent rules will create considerable market uncertainty and, as a practical matter, limit LPI devices to the U-NII-6 and U-NII-8 bands.

The Commission need only look at its still pending 2016 Database Accuracy proceeding that, despite its name, primarily focused on indoor operation of TV White Space Devices (“WSDs”).<sup>9</sup> Now, as then, the challenge continues to be how to accurately locate indoor devices in all three dimensions where a commercial GPS signal,

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<sup>6</sup> See RKF Study at 15.

<sup>7</sup> See Comsearch Comments at Appendix A, Sharing in the 6 GHz Band by Unlicensed Low-power Indoor Devices; Lauri Sormunen *et al.*; Nokia Bell Labs, Coexistence of Unlicensed National Information Infrastructure (U-NII) Devices with Fixed Links at 6 GHz (2018)(assuming “full buffer” 100% duty cycle), as attached to Nokia Comments; Roberson and Associates, LLC, Technical Analysis of Impact of Unlicensed Operations in U-NII-8 on Globalstar Mobile Satellite Service (2018)(assuming 10% duty cycle), as attached to Globalstar Comments.

<sup>8</sup> FWCC Comments at 6.

<sup>9</sup> See Amendment of Part 15 of the Commission’s Rules for Unlicensed White Space Devices, Notice of Proposed Rulemaking and Order, FCC 16-23, 31 FCC Rcd 1657, rel. Feb. 26, 2016 (“Database Accuracy NPRM”). See also Comments of Microsoft Corporation filed May 6, 2016 in response to the Database Accuracy NPRM, ET Docket No. 16-56.

the most common form of geolocation, does not penetrate. Even where a commercial GPS signal does penetrate, there is currently a +/- 15-meter measurement-to-measurement variation in determination of the z-axis (device height), which currently has to be taken into account.

The current WSD rules require fixed and Mode II personal / portable WSDs to self-report their location and the uncertainty associated with the WSDs' determination of its location at the 95 percent confidence level. While this rule is better than the previous absolute limit of 50 meters, depending on the final rules that are adopted, even the geolocation plus location uncertainty reporting rule may present challenges for a mass market consumer device. Our understanding is that advances in more precise GPS, priced for consumer devices, should be available shortly. Longer term, our hope is that the technologies developed to meet the Commission's recently released indoor E-911 proceeding will be broadly adopted across all communications devices. The Commission should take heed of its experience with WSDs and not require AFC for LPI devices in any of the 6 GHz U-NII bands.

#### **A. FWCC Applies The Worst Worst-Case Analysis**

FWCC asserts that an LPI device can cause interference if the device, whether in a one or two-story house or a high-rise dwelling or office building, is in the boresight of an FS receive antenna, almost regardless of the distance between the LPI device and the FS antenna.<sup>10</sup> The FWCC analysis, however, is badly flawed. The bottom line is that

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<sup>10</sup> FWCC Comments at 10, 18 – 22.

LPI devices can operate without causing harmful interference to incumbent FS links in the U-NII-5 and U-NII-7 bands without an AFC system.<sup>11</sup>

First, the FWCC argument is internally inconsistent because it applies multi-path fade loss to FS links but not to LPI devices. FWCC asserts that:

Multipath fading occurs only on links at least a few kilometers long. Most 6 GHz links are long enough for multipath to be a threat, while the link between an RLAN and a victim FS receiver is too short for multipath to provide any useful attenuation.”<sup>12</sup>

FWCC subsequently asserts that if an LPI device “falls in an FS receiver boresight, even through a 20 dB wall, it will cause interference out to a distance of 10.2 km;”<sup>13</sup> that an LPI device will cause interference out to 12 km from the FS receiver (even assuming 30 dB wall attenuation);<sup>14</sup> and that “[a]n FS antenna with an RLAN in the boresight and no intervening blockages will receive interference from tens of miles away ....”<sup>15</sup> In its calculations, however, FWCC assumes free space path loss from the LPI device to the FS antenna, regardless of the distance.<sup>16</sup> By its own arguments, FWCC should apply multi-path fade loss for LPI devices that are more than “a few kilometers” away from an FS receiver. So, if an LPI device is 3 km or more removed from the FS receiver, then either (1) the FS link will be operating during the day with substantial fade margin; or (2) the FS link *and* the LPI device will be operating at night, or during inclement weather, with multi-path fading affecting *both* links. If so, this would further reduce the real-world risk

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<sup>11</sup> Microsoft refers readers to the 6 USC Reply Comments for a more detailed discussion of this matter.

<sup>12</sup> FWCC Comments at 16.

<sup>13</sup> Id. at 20.

<sup>14</sup> Id. at 21.

<sup>15</sup> Id. at 9.

<sup>16</sup> Id., Attachment A at 4 and 6 (“Assume path loss is free space”).

of interference from an LPI device more than a few kilometers from the FS receiver, even if it is within boresight.

UTC makes a similar, asymmetric argument regarding multi-path fading. UTC asserts that:

a significant fade margin is built into the design of microwave systems .... A fade margin of up to 40 dB is typically part of the specification, given that some links are up to 50 miles in length and can be subject to interference during inclement weather.”<sup>17</sup>

So, UTC wants the Commission to assume multi-path fading for the FS links, but no multi-path fading whatsoever for unlicensed services. As explained above, this is an incorrect assumption.

Second, and consistent with its approach of applying the worst worst-case for every parameter, FWCC assumes use of a Category B2 antenna, with a maximum beamwidth of 4.1 degrees.<sup>18</sup> FWCC ignores the far more common Category A and Category B1 antennas, which have a maximum beamwidth of 2.2 degrees. Microsoft reviewed a large sample of FS antennas licensed in the State of Washington and found that most active receiver antennas’ beamwidths are considerably less than 2.2 degrees. The smaller the beamwidth, the greater the distance before the boresight of the antenna reaches the ground. And, as explained above, the greater the distance, the greater the impact of multi-path loss from the LPI device to the FS receive antenna. For example, for an FS receive antenna mounted 100 feet above ground level with a receiver beamwidth of 1 degree, the horizontal distance in Figure 2 of the FWCC Comments approaches three kilometers. Attaining the required geometry for the boresight of the FS

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<sup>17</sup> Utilities Telecommunications Council, et al. (“UTC”) Comments at 14.

<sup>18</sup> FWCC Comments at 9 (Figure 2).

antenna to align with the LPI device will be extremely unlikely, and therefore, in nearly all cases, there will be a significant angular mismatch between the LPI device and the fixed link receiver. Further, the LPI device would have to be pressed up against a window or glass door and would have to be tilted at just the perfect angle so that enough of the radiated power in its omnidirectional beam finds its way into the boresight. Such alignment and positioning is highly unlikely.

The other LPI interference scenario raised by FWCC is from an LPI deployed in an urban high-rise building with line-of-sight into an FS antenna. FWCC admits that high-rise construction offers better attenuation than some other structures, but asserts that such attenuation can be offset by much shorter interference paths.<sup>19</sup> An FS link with boresight to a high-rise building is highly unlikely. As 6 USC observed:

This would be a highly unusual case because the presence of such a building could itself seriously disrupt performance of the link, making such configuration rare within the universe of properly engineered FS paths.<sup>20</sup>

## **B. Opponents Understate the Link Margins**

Incumbent operators expressed concern about how commenters supporting unlicensed operations across the 6 GHz band considered multi-path fading and fade margins. Multi-path fading occurs at certain times of the day and in bursts. According to NTIA, however, “microwave fading due to multipath (*i.e.*, in bands below about 13 GHz) generally occurs during the period midnight to 8:00 am,”<sup>21</sup> and “[t]he deepest fades

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<sup>19</sup> Id. at 10.

<sup>20</sup> 6 USC Comments at 21.

<sup>21</sup> Interference Protection Criteria: Phase 1 – Compilation from Existing Sources, NTIA Report 05-432, Oct. 2005 at page 4-8, [https://www.ntia.doc.gov/files/ntia/publications/ipc\\_phase\\_1\\_report.pdf](https://www.ntia.doc.gov/files/ntia/publications/ipc_phase_1_report.pdf).

generally occur in the morning hours, quite often near sunrise.”<sup>22</sup> Despite what some opponents may assert, the NTIA reports indicate that the greatest impact of multi-path fading on fixed links occurs during times of the day outside of Wi-Fi busy hours.

The rest of the day, there is a fade margin, and often a substantial fade margin. The Commission recognized that fade margin would, in cases of larger separation distances, further reduce the risk of harmful interference from an LPI device to an FS receiver.<sup>23</sup> Microsoft does not believe it is the Commission’s intent to use fade margin as the primary mitigation strategy. Rather, fade margin is just one of many mitigating factors to be considered when evaluating the real-world risk of interference to incumbent FS links.

Many incumbent operators assert, without support, that their FS links operate with “no excess fade margin, at least at night.”<sup>24</sup> Microsoft encourages the Commission to examine this assertion carefully. In Microsoft’s experience, engineers make highly conservative assumptions, and among other things, provide a margin for fade loss and/or provide the ability to increase power in the event of worst-case fade loss.

### **C. Broadcast Interests Overstate the Risk of Harmful Interference to BAS and LPAS**

Commenters from the broadcast industry, including the National Association of Broadcasters (“NAB”), the Society of Broadcast Engineers (“SBE”), and EIBASS express concern about (1) standard-power access points operating with AFC and (2) LPI

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<sup>22</sup> Atmospheric Channel Performance Measurements at 10 to 100 GHz, NTIA Report 84-19, April 1984 at 59 (Section 4.3.3 – Multipath Fading).

<sup>23</sup> NPRM at ¶ 45.

<sup>24</sup> See e.g. FWCC Comments at 17. See also NPSTC Comments at 9 (“Given the modeling and expense to meet a specified fade margin for a path, it is highly doubtful there is any excess fade margin not required to maintain the engineered path reliably.”)

devices operating without AFC in the U-NII-6 and U-NII-8 bands. Microsoft agrees with the broadcast interests that the Commission should not authorize standard-power access points to operate in the U-NII-6 band and in the upper 150 megahertz of the U-NII-8 band. However, Microsoft submits that standard-power access points can operate in the lower 100 MHz of the U-NII-8 band in locations outside of Broadcast Auxiliary Service (“BAS”) and Cable Television Radio Service (“CARS”) licensed areas, assuming the Commission acts on its rules for Local Television Transmission Service (“LTTS”).<sup>25</sup> Microsoft agrees with the Commission’s proposal that LPI devices can operate in the U-NII-6 and U-NII-8 bands without AFC. For various reasons, as explained below, the broadcast interests overstate the risk of harmful interference.

The three areas of concern to the broadcast industry appear to be (1) ‘camera-backs’ in indoor and outdoor venues; (2) Part 74 Low Power Auxiliary Service (“LPAS”) devices, *i.e.* licensed wireless microphones; and (3) BAS receive-only sites. First, NAB and SBE raise concerns regarding potential interference from LPI devices operating in the U-NII-6 and U-NII-8 band into low-power portable camera-back transmitters used indoors and at confined outdoor venues to relay video and audio content at stadiums, arenas, public buildings, *etc.*, to production trucks, fixed receive sites or temporary relay sites.<sup>26</sup> However, camera-back transmitters are not dependent on the 6 GHz band. Other frequency bands, as well as bonded cellular, are available for such transmitters. More importantly, interference between camera-back transmitters and 6 GHz LPI devices is highly unlikely in the real world. Given the relatively short range of an LPI device

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<sup>25</sup> See 47 CFR §§ 101.803 and 101.805.

<sup>26</sup> See SBE Comments at 2.

operating in these indoor and confined outdoor venues and the scope of spectrum to be made available in the 6 GHz band, interference could only occur if the camera-back operator is operating on the same U-NII-6 or U-NII-8 channel as, and in close proximity to, the LPI devices. Where licensed operations occur indoors, they are almost exclusively under the control of a single entity, which either controls or works closely with the facility in which the operations are taking place. Any operator of a facility that contains both licensed and unlicensed operations will be able to coordinate the radiofrequency environment to avoid interference.<sup>27</sup> The venue operator can manage the frequency bands and/or channels being used by camera-back devices and LPI devices to ensure that there is no interference. Venue operators can take the same steps to ensure that there is no interference to UWB operations in sporting stadiums and arenas.

Second, the licensed Part 74 devices operating in the lowermost and uppermost 25 megahertz channels within the U-NII-8 band must be operated by licensed Part 73 operators. Importantly, at present there are no Part 74 commercial wireless microphones designed to operate in the 6 GHz band.<sup>28</sup> If wireless microphones are ever developed commercially for the 6 GHz band, they would be for ENG applications. For example, 6 GHz band spectrum for wireless microphones could be used for the short distance link between the on-air talent's hand-held microphone and the video camera. The wireless microphone's signal is relatively strong compared to considerable background noise over a link that may only be a few feet long. Further, as explained above, a venue operator

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<sup>27</sup> See e.g., Wi-Fi Alliance Comments at 15; 6 USC Comments at 30.

<sup>28</sup> See e.g., EIBASS Comments at 4 ("EIBASS is not aware of any currently available Part 74 [U-NII-8] wireless microphones ....")

can manage the frequency bands and/or channels being used by LPAS microphones and LPI devices to ensure that there is no interference.

Third, Microsoft's Comments explained why interference from LPI devices to BAS receive-only sites is highly unlikely in the real world.<sup>29</sup> In order to close the link from a news truck to a fixed receive-only site, the operator must move the truck and maneuver the steerable narrow beam antenna. NAB's link analysis is overly conservative because it presumes the undesired 6 GHz LPI access point signal is near a window and perfectly aligned with the receive-only antenna.<sup>30</sup> It also assumes free-space propagation and ignores sources of attenuation of the LPI signal.<sup>31</sup> As described above, it is highly unlikely that the LPI device will be operating within boresight of the receive-only antenna. And even if so, as explained above, it is likely that there will be a suitable margin and/or both the news truck transmitter and the LPI device will experience multipath fading. In all events, there is a simple low-cost remedy – move the truck and/or re-point the steerable antenna.

In sum, concerns about possible interference from LPI devices to indoor BAS or LPAS operations are misplaced. The Wi-Fi Alliance demonstrated in its Comments that such interference is highly unlikely, and therefore, that “no additional restrictions are necessary to protect licensed *indoor* operations.”<sup>32</sup> With regard to BAS operations, the Wi-Fi Alliance explained that:

Where licensed operations occur indoors, they are almost exclusively under the control of a single entity, which either also controls or works closely with the

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<sup>29</sup> See Microsoft Comments at 6 – 7.

<sup>30</sup> NAB Comments at 9 – 11.

<sup>31</sup> Id. at 15 – 16.

<sup>32</sup> Wi-Fi Alliance Comments at 15 (emphasis in original).

facility in which the operations are taking place. Any operator of a facility that contains both licensed and unlicensed operations will be able to coordinate the radiofrequency environment ... to avoid interference.<sup>33</sup>

With regard to LPAS operations, 6 USC explained that:

LPAS is typically used in closed venues and at specific events, where the radiofrequency environment can be centrally managed. The venue owner can choose to operate LPAS devices on different frequencies than those being used by RLAN devices.<sup>34</sup>

Likewise, concerns about interference to outdoor operations by news trucks are also misplaced. Angular mismatch makes it highly unlikely that LPI devices will align exactly with the boresight of the link from a news truck to the receive-only antenna.

Further, news trucks have the flexibility, and experience, to simply move in those rare cases where they are experiencing interference.

#### **D. The Commission Can Adopt Rules to Ensure that LPI Devices Are Only Used Indoors**

Microsoft submits that a combination of Commission rules and market imperatives can ensure that LPI devices are only used indoors. Microsoft supports the following requirements for LPI devices:

1. The device must be operable only when directly connected to a power outlet.<sup>35</sup>
2. The device must automatically shut-down if it detects a GPS signal above a certain threshold.<sup>36</sup>

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<sup>33</sup> Id. at 15.

<sup>34</sup> 6 USC Comments at 30.

<sup>35</sup> NPRM at ¶ 71.

<sup>36</sup> Id.

3. The device must be labelled with a sticker on the base station stating, in large font, that the device may only be operated indoors, and cautioning that operation near a window or exterior door may cause the device to shut down automatically.
4. The device must be prohibited from using a directional antenna.<sup>37</sup>

By enacting the rules proposed above, the Commission will almost certainly ensure that LPI devices will not be designed to be weather-proof, which will further limit the possibility of the devices being used outdoors.<sup>38</sup> Microsoft opposes a specific regulation that LPI devices not be weather-proof; such a requirement would be difficult to define and enforce. Microsoft also opposes any requirement for professional installation. Such a requirement would exponentially raise the cost of LPI devices, and make them prohibitively expensive for consumers and small businesses.

### **III. THE COMMENTS DEMONSTRATE BROAD SUPPORT FOR MAXIMUM FLEXIBILITY FOR LPI DEVICES**

The record provides strong support for Microsoft's proposals that LPI be permitted to operate across the entire 6 GHz band without AFC, and that LPI devices be permitted to operate at the same maximum power level as LPI access points. Support comes from service providers, technology vendors, the cable television industry and public interest organizations.<sup>39</sup>

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<sup>37</sup> Wi-Fi Alliance Comments at 18.

<sup>38</sup> *See id.* at 18.

<sup>39</sup> *See e.g.* 6 USC Comments at 17 – 18 and 49; Wi-Fi Alliance Comments at 10 – 11 and 17; Broadcom Inc. Comments at 5 - 6 and 36 - 37; Qualcomm Incorporated Comments at 9 – 11 and 16 – 17 (“[a]n AFC system is not needed to protect incumbent operations from unlicensed LPI operations.”); Boeing Company Comments at 6 – 7 (permitting the use of LPI devices across the entire 6 GHz band “would substantially reduce the costs of U-NII-5 and U-NII-7 devices that are designed solely for indoor use.”); Wireless Internet Service Providers Association Comments at 27 – 29; and Open Technology Institute at New America *et al.* Comments at 17 – 20.

The Comments of NCTA – The Internet & Television Association (“NCTA”) are particularly relevant because some of its programmer and network affiliate members utilize the U-NII-5 band for Fixed-Satellite Service uplinks, and the U-NII-6 and U-NII-8 bands for BAS ENG links and LPAS for wireless microphone operations. As such, NCTA recognizes the importance of protecting incumbent licensed operations, while also recognizing that “Wi-Fi is essential to Americans’ broadband experience, and its importance continues to grow.”<sup>40</sup> NCTA “favors the ability to deploy indoor, low-power APs across all 6 GHz sub-bands without AFC ....”<sup>41</sup> NCTA correctly notes that “[a]n AFC requirement in the U-NII-5 and U-NII-7 bands would unnecessarily burden indoor residential and small business deployment with recurring costs, depressing incentives to deploy widely in these sub-bands.”<sup>42</sup>

NCTA also supports a maximum conducted power of 250 mW for devices not subject to the AFC,<sup>43</sup> in order to “enhance the experience of end users by increasing the devices’ coverage and range,” and “reduce the disparity between downlink and uplink data carrying capacity and simplify the design of AP antenna systems.”<sup>44</sup> Charter Communications, Inc. (“Charter”) agrees that LPI should be permitted to operate across the entire 6 GHz band without AFC, and that LPI devices should be permitted to operate at the same maximum power level as LPI access points.<sup>45</sup>

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<sup>40</sup> NCTA Comments at 16.

<sup>41</sup> Id.

<sup>42</sup> Id.

<sup>43</sup> The NPRM proposed a maximum conducted power of 250 mW for LPI access points, but only 63 mW for LPI client devices.

<sup>44</sup> NCTA Comments at 17.

<sup>45</sup> Charter Comments at 3 – 4.

#### **IV. THE COMMISSION SHOULD ENSURE THE ACCURACY OF THE ULS DATABASE**

Microsoft agrees that for the AFC to be successful the ULS needs to be accurate. Several commenters, including Microsoft, proposed that only those links registered in the ULS should be protected by the AFC. Even though licensees have an obligation to provide the Commission with current and accurate information, the consensus is that there is incomplete, inaccurate and out-of-date information in ULS, including registrations for fixed link transmitters that are no longer in operation. Microsoft supports providing incumbent licensees a reasonable period of time during the AFC development process to review and update their records, if necessary. This includes the modification of existing records to add or correct information and the deletion of links that are no longer in service. Microsoft also supports allowing fixed service operators to re-coordinate their links, if necessary, in connection with updating their records. We agree with the commenters that the Commission should grant a waiver of the standard filing fees for updating these records. In the case of defunct fixed service operators, the Commission may have to set aside funding to audit its records to ensure that links registered to such operators are deleted from the database. It is in the public interest to have an accurate ULS database.

## **V. CONCLUSION**

For the reasons set forth above, Microsoft urges the Commission to move forward expeditiously to authorize LPI operations across the entire 6 GHz band and standard-power operations in the U-NII-5 and U-NII-7 bands and in the lower 100 megahertz of the U-NII-8 band. Making available 6 GHz band spectrum for shared use is essential to providing sufficient unlicensed capacity to meet the rapidly growing demand for high-throughput Wi-Fi channels.

Respectfully submitted,

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